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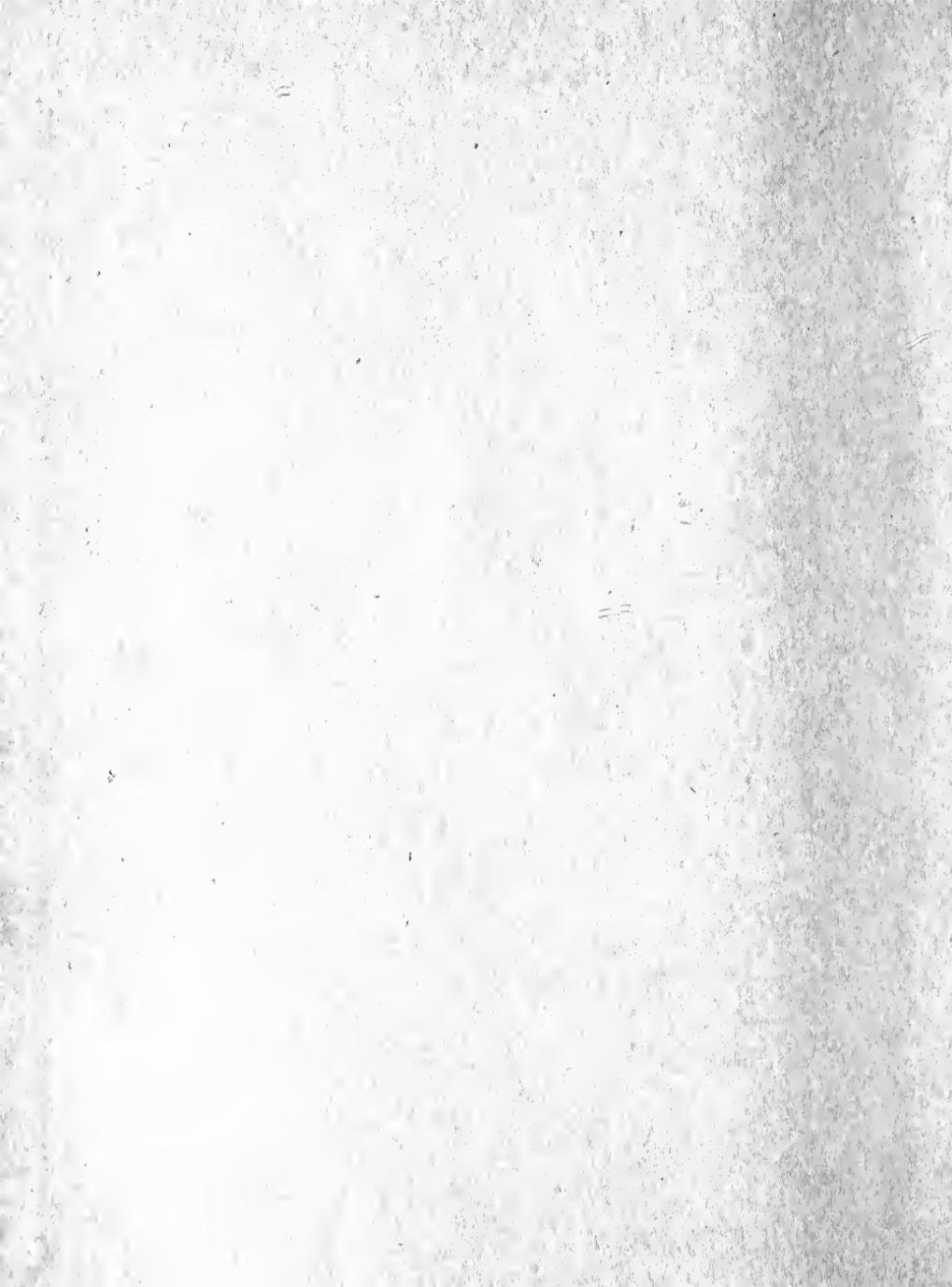
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# **PORCELAIN INLAY**

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**A TREATISE ON ITS  
THEORY AND PRACTICE  
IN DENTISTRY**

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**By ARTHUR E. PECK, M. D., D. D. S.**

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## PREFACE

**I**N presenting this system of Porcelain Inlay to the dental profession, I do so, realizing that it is but a step forward in the progress of dental art, and as such, it is based upon the experience and discoveries of others, which makes it difficult, if not impossible, to trace the origin of an idea. I shall not attempt to give credit to whom it may rightfully belong, but feel grateful to those who have cleared the way; and in the evolution of dentistry, trust that my thought, with that of others, may have produced a system, whose detail of the technique is sufficiently

clear to enable the many to obtain artistic results by purely mechanical steps. Those who produce accurate work by the burnished system, do so because of having exceptional manipulative ability, which is as impossible for them to transmit to others, as it is for the artist to explain how he produces apparent life in his pictures. The draughtsman obtains artistic results by the joining of lines drawn at certain angles. This knowledge is transmissible, as it is the application of a principle, by mechanical means, which will always produce a certain result.

The author of this work has endeavored to formulate a system

controlled almost entirely by mechanical principles, therefore, it can be easily followed and will insure to the large majority as uniform results in porcelain as those obtained with other filling materials.



**a—Matrix Strip.**  
Used for taking impression of the cavity.

**b—Re-enforcing Ring.**  
Used to retain the backing material for the impression.

**c—Die-Cup Receptacle.**  
For holding the die-cup and plunger while swaging.

**d—Die-Cup.**  
For holding the impression die.

**e—Plunger.**  
The means of swaging the matrix.

**f—Porcelain Crusher.**

**g—Baking Strip.**  
A piece of fire-clay on which the inlay is baked.

**h—Bottle of Liquid Glaze.**

**i—Asbestos Cooling Disk.**  
On which the inlay is placed when baked.

**j—Cap for Cooling.**  
Which is placed over the inlay while cooling.

**k—Bottle of Inlay Polish.**



PLATE I.



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## A SYSTEM OF PORCELAIN INLAY

**P**ORCELAIN has a distinctive field in the practice of dentistry. It is not calculated to entirely supplant gold, amalgam, or other filling materials, and its application requires good judgment and a thorough comprehension of its limitations as well as its advantages.

The road to success, in this class of work, is not an easy one, but the satisfaction in being able to use porcelain successfully is worthy of the effort.

A practical case should not be attempted until the technique has

been thoroughly mastered, and a cavity of each class has been prepared *out of the mouth*. A complete knowledge of the technique alone will insure a successful operation *in the mouth*. This fact cannot be impressed too emphatically.

Porcelain inlay work will not admit of slighting in any particular, therefore any short-cut method should be thoroughly investigated before being adopted, as it usually leads to imperfections. In no branch of dentistry is painstaking thoroughness more essential.

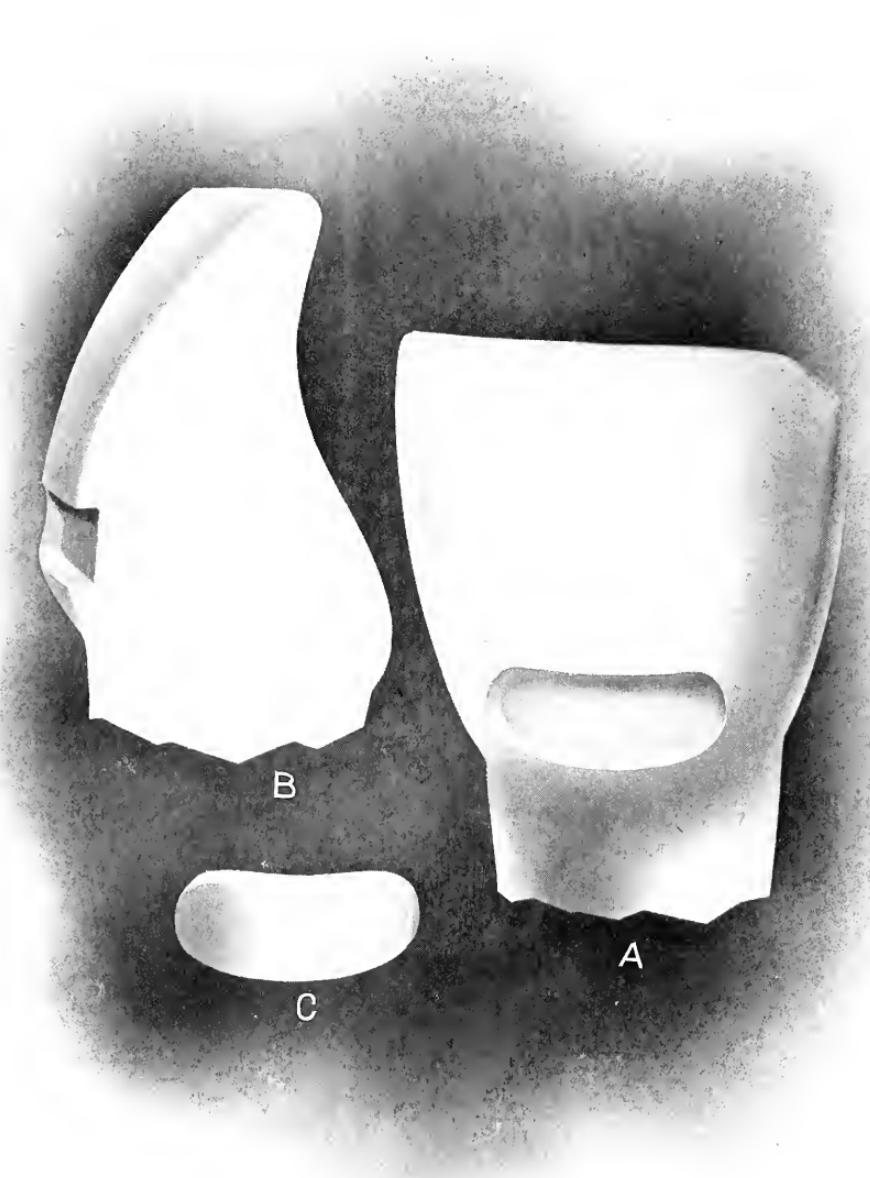
For this system, cavity preparation is divided into eight classes:

- 1.—Cavities involving one surface, labial cavities.
- 2.—Cavities involving more than one surface, mesio-labial.

- 3.—Cavities involving mesio-labial-lingual.
- 4.—Cavities involving mesio-labial-lingual-incisal.
- 5.—Cavities involving labial-lingual-incisal.
- 6.—Cavities involving the whole incisal edge.
- 7.—Cavities involving the approximal and occlusal surfaces of the posterior teeth.
- 8.—Cavities involving the whole occlusal surface of the posterior teeth.

The three initial steps in cavity preparation are the same in this as in all others; first, breaking down of undermined enamel; second, removal of the softened dentine; third extension for prevention. *But the fourth, extension for retention, is a distinctive feature of this system, the theory of which must be fully comprehended before any attempt to put it into practice in the mouth.*





## LABIAL CAVITIES



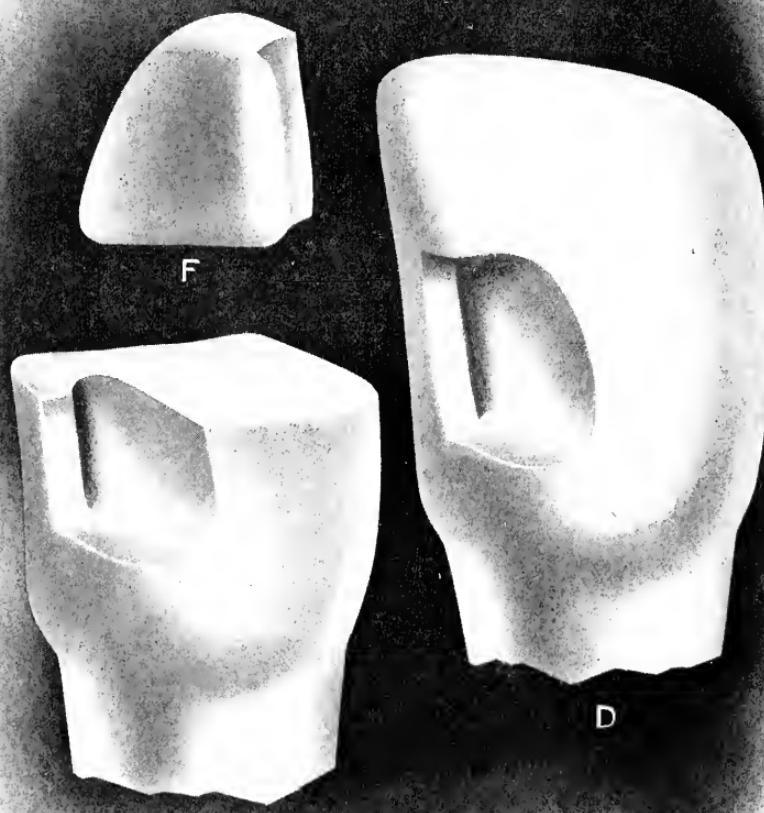
THE preparation for the first class (labial cavities), which involves only one surface of the tooth, differs only from the usual preparation in that the walls of the cavity must be *perpendicular to the respective surfaces* of the tooth which the lines of the wall intersect. This preparation gives a body of porcelain whose lines are perpendicular to each other, thus giving to the inlay all possible strength, obviating the acute angle (or thin fragile edge), which is to be avoided at all hazards.

Plate II, Figure A, shows a full view of this preparation.

Figure B shows a cross-section from the incisal edge to the gingival border, illustrating the angle of the walls of the cavity in relation to the surface of the tooth.





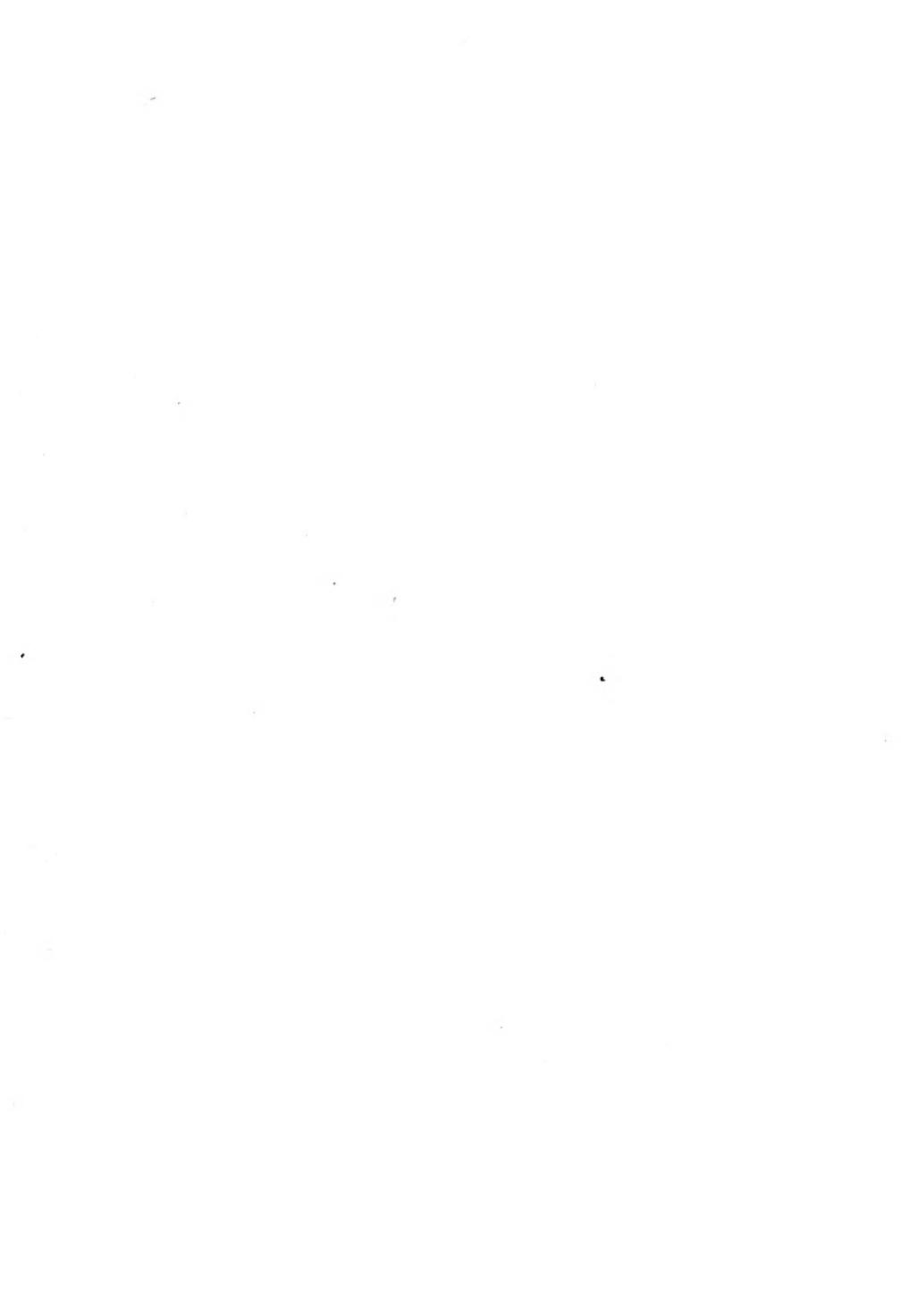


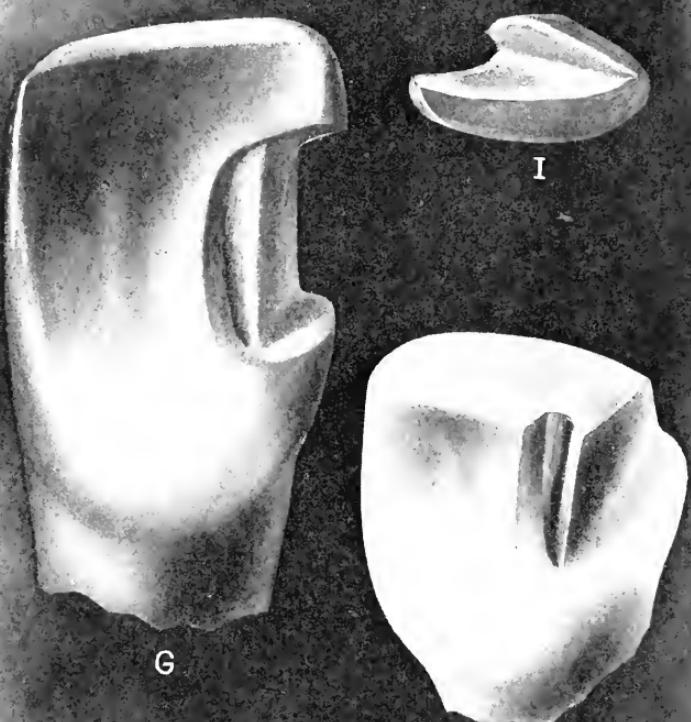
## MESIO-LABIAL

**I**NLAYS for cavities of the second class, which involve the labial and approximal surfaces (but not the lingual) are inserted without a separation of the teeth. Plate III, Figures D and E, show the method of preparation with the retention, which is obtained by means of a groove in the bottom of the cavity, extending lengthwise of the tooth. It will be noticed that the incisal and gingival borders of the cavity are at right angles to the approximal surface. This gives a solid body of porcelain, which is very essential to the

life of the inlay. Figure F shows the inlay with the retention ridge.

The cross section, Figure E, shows the groove for retention.





## MESIO-LABIAL-LINGUAL



CAVITIES of the third class (mesio-labial-lingual), give the best opportunity for artistic results. In this class we not only extend for prevention, but for retention also. These fillings should be inserted from the lingual surface, and the extension for retention must extend to the firm tooth substance. A slight grooving in the floor of the cavity near the margin on the lingual surface, as shown by Plate IV, Figures G and H, will give a perfect retention from all lateral pressure. Figure I shows the ridge on the inlay.

The walls of the cavity, from the lingual surface to the labial, must be slightly v-shaped, which will avoid loosening from lingual pressure. Labial strain will not be sufficient to disturb it.

Cavities of this class can approach the incisal edge much closer than would be safe in preparing for a gold filling. It is the force of the blow in the operation that weakens the enamel prisms, thus causing a gold filling to fail. But, if the enamel rods are left in perfect condition and an inlay that exactly fits is cemented in, they then have nearly, if not the same support they had before the ravages of decay set in.





## MESIO-LABIAL-LINGUAL- INCISAL



CAVITIES of the fourth class (mesio-labial-lingual-incisal) are the most difficult, and require a great deal of good judgment, skill and patience.

Plate V, Figure J, represents a typical preparation to illustrate this class of cavities. The formation is such that most of the retention is obtained by means of grooves, thus avoiding a deep seat in the tooth which not only encroaches on the pulp so as to menace the life of the tooth but also weakens the walls and necessitates a wide separation to

admit removal of the impression and insertion of the filling.

The preparation for this class of cavities, as illustrated by Plate V, is as follows:

After the margins for the labial and approximal surfaces are secured, the extension for retention on the lingual surface is started from the incisal edge, gradually sloping back to the firm tooth substance near the gingivo-lingual border, keeping well in mind that the walls must be perpendicular to the surface of the tooth. For this preparation, use first the Gem Cavity point No. 13, S. S. W., followed by the Fissure Bur No. 57; then the Fissure Finishing Bur and for the final margin



VARIATIONS IN THE FOURTH CLASS CAVITIES



when accessible, use the Arkansas Stone point No. 5, S. S. W. The Pear shaped Bur is used for the retention groove. Disks can be used to outline the cavities but the final adjustment of the margins should always be made with the Arkansas point or the Fissure Finishing Bur.

Retention from lateral and lingual strain is obtained by the groove in the base of the cavity as illustrated by Figure K, which is a cross-section of Figure J.

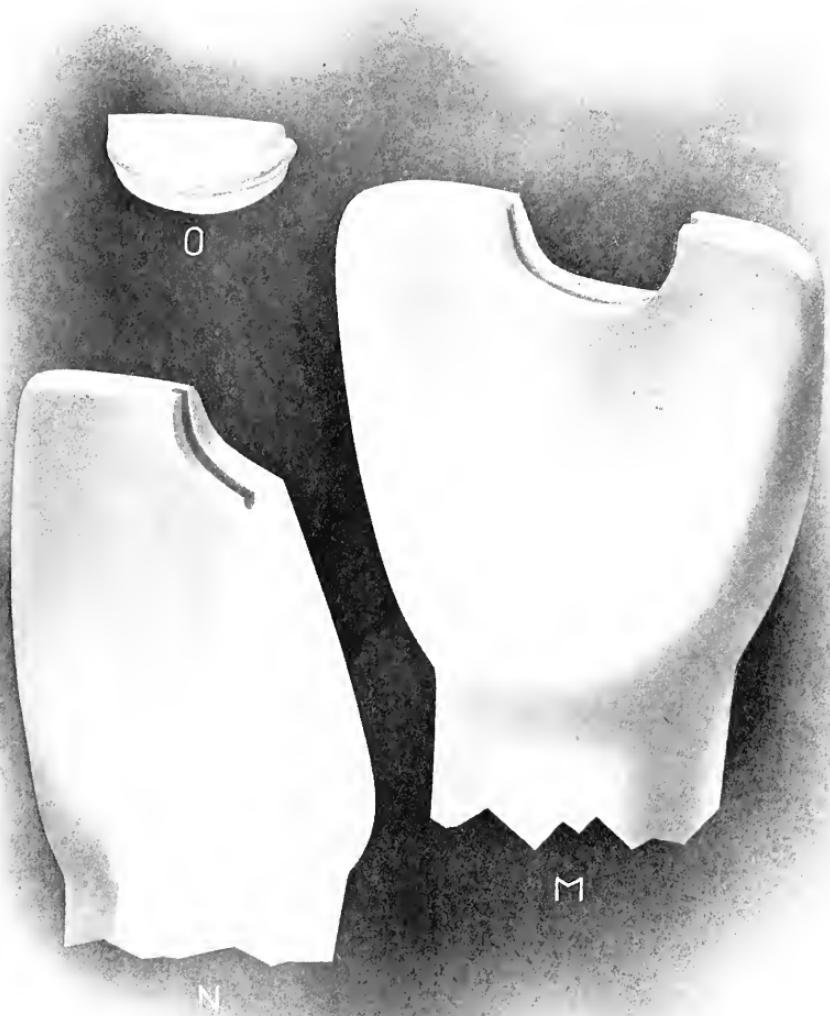
A cavity prepared on this principle will not require a separation to remove the impression, or to insert the filling.

It will be readily understood that the principle of retention is *grooves*

instead of a deep seat in the cavity. A groove should be made wherever it will resist the strain of mastication.

The grooves must be made so that the impression *will draw*. The cuts are intended to illustrate only the typical cases and make clear the principles involved. The advantages in this system of cavity preparation are: that a groove or depression at points in the cavity will not endanger the pulp, and give a much better retention for the filling than the ordinary saucer-shaped cavity. It also avoids the necessity for a wider separation than for gold.





## LABIO-LINGUAL-INCISAL



CAVITIES of the fifth class, involving labio-lingual-incisal, are illustrated on Plate VI, Figure M. While the cavity, at first glance, seems to show a v-shape, it will be noticed that for a short distance back from the incisal edge the walls are perpendicular to the incisal surface. This is essential, as it gives a solid piece of porcelain without the fragile edge. A slight groove down the sides and across the base of the cavity will give it sufficient retention and yet allow an impression to be drawn from it. Figure N is a cross-

section gingivo-incisal, showing re-  
tention groove. Figure O shows  
the inlay with its retention ridge.





VARIATIONS IN THE FIFTH CLASS CAVITIES





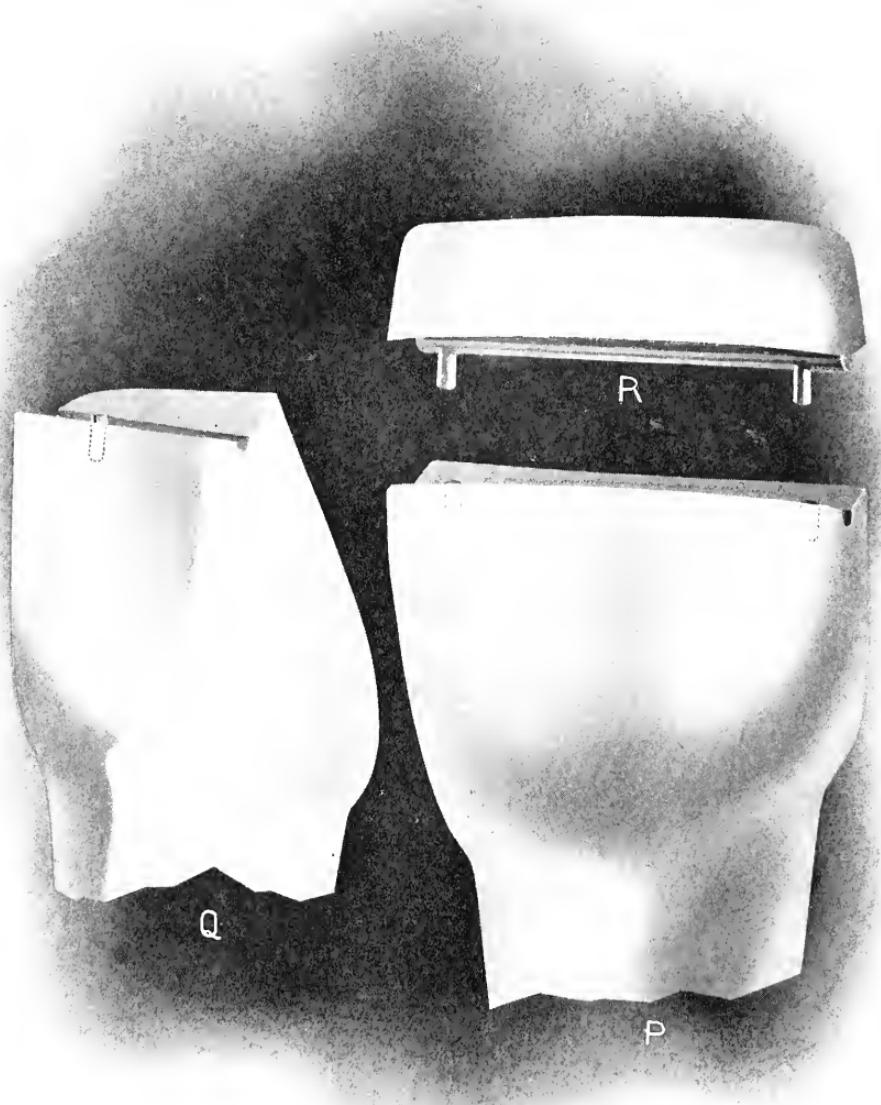


PLATE VII.

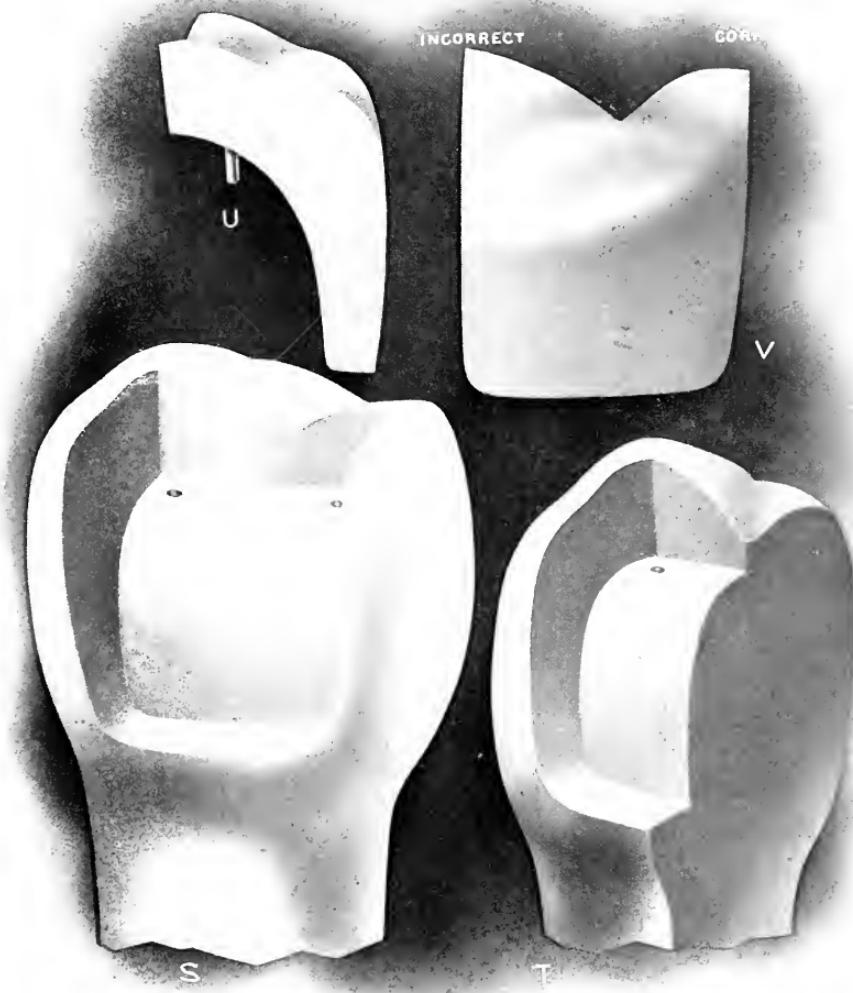
## INCISAL EDGE

 UNDER the sixth class we have a cavity involving the whole incisal edge. Plate VII, Figures P and Q, illustrate the preparation, which is made mostly by means of a stone, slightly grooving the center of the cavity, mesio-distally, and bringing the margins at the labial and lingual surfaces to a sharp edge. On either side of the pulp a slight depression is made with a round bur to mark the place for the pins to be inserted. This will be transferred to the matrix, giving a correct guide for placing the pins. Figure R

shows the inlay with the pins in position. The pins should be about 21 standard gauge.







## APPROXIMAL AND OCCLUSAL



CAVITIES of the seventh class, involving the approximal and occlusal surfaces of the posterior teeth, must be cut well out to bucal and lingual surfaces; unless this is done it is almost impossible, especially with the occlusal surface, to get perpendicular walls of porcelain, so essential to strength. Plate VIII, Figure S, is a view looking down into the cavity. Figure T, same plate, is a cross-section showing the location of pins. Figure U shows the inlay with one of the retention pins.

Figure V shows the inlay with a correct angle of porcelain on the right and an imperfect shape (acute angle) on the left, that is almost certain to be made unless the cavity is cut well out to the margins.

To be successful in this class of cavities, where so great a pressure is brought to bear, a solid body of porcelain is absolutely necessary. Pins are preferable to grooves for retention. With a round bur make a slight depression at the point in the cavity where the pins are to be placed. This will be transferred to the impression and in turn to the matrix. After the matrix is invested in the investing material (which hardens in a short time) the matrix

can be perforated at the point indicated by the depression and the pin inserted into the investment, allowing the point to project a sufficient distance to support the inlay. The investment material will hold the pin in position while fusing.



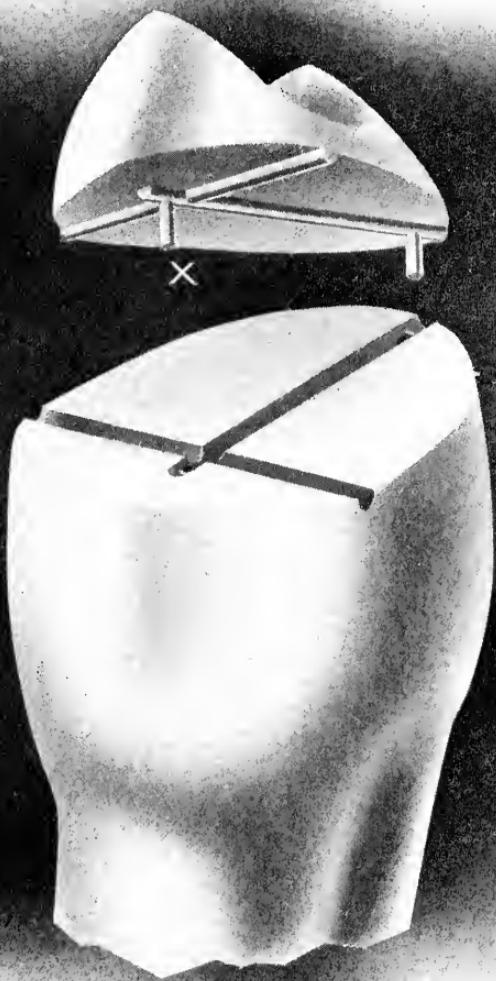
## POSTERIOR OCCLUSAL



AVITIES of the eighth class, involving the occlusal surfaces of the posterior teeth, open a field worthy all the time and expense required to become proficient in this class of work. To be able to restore with porcelain the contour, color and service of teeth that have been worn off so much as to require the bite to be opened is certainly a great step in dentistry, and the restoration in cases of this class with unsightly gold fillings may now be a practice of the past.

Plate IX, Figure W, gives a view of this preparation, showing the





grooves and depressions marking the site of the pins. Figure X gives a view of the inlay with its retention ridges and pins in position.

(See special instruction for matrix formation and placing the pins in the chapter on Matrix Formation.)



## COLOR AND MATERIAL

**A**NY of the porcelain bodies on the market, either high—or low—fusing, may be used with this system. The following method for obtaining color is given because it is the one used exclusively by the writer in his practice, and in giving it he does so, believing it to be one of the most simple and satisfactory known to the profession. Select a tooth a shade lighter than the color of the tooth to be matched. With a pair of excising forceps remove that portion of the tooth desired, and grind out of it any color not wanted. Then it is pulverized in the crusher (f, Plate I),

and removed to a Wedgewood mortar, which should be kept for this purpose alone, and therein ground to an impalpable powder, which fuses at a lower temperature than the original porcelain tooth, owing to its being pulverized to a much finer degree than it was in the original baking.

Often times it is advisable, particularly in large contour fillings, to shade the inlay. If so, usually the neck of the tooth will answer. This is treated the same as the tip and blended with the other color when building the inlay.

While this method of getting color is positive, as stated, it must be remembered that the light at the time

the tooth is selected may not be the same as when it is put in. Here is an occasion when experience and judgment alone will insure positive results. The rule is to select the porcelain tooth just a shade lighter than the tooth to be matched, so as to allow for shadow effect of the cement. This method of obtaining color must be used because of the cement which we now have, but if a transparent cement can be obtained, then the color of the tooth must be matched exactly, as there will be no shadow reflection to overcome.

Cleanliness is an important matter in making an inlay and the slightest particle of dust or powder from the

previous bake, if left in the mortar, will change the color.

The steel mortar and pestle should be thoroughly cleaned with gasoline when it is received, and wiped with a clean cloth each time before using. Slight particles of iron or grease may be found in the mortar for some time. *It is of vital importance to remove every particle of iron with a magnet immediately after it comes from the steel mortar.*

## TAKING IMPRESSIONS



T is not necessary to put the rubber dam on to take an impression. Place a folded strip of cottonoid under the lip; dry the cavity and dust well with soapstone; then allow the patient to bite on another piece of cottonoid; mix the cement (which should be Britton's yellow powder) to a consistency which will allow it to be handled with the fingers. Into the cement incorporate a sufficient amount of soapstone until the adhesiveness is destroyed. Plate X, Figure Y, represents the cavity of which the impression is to be taken. The matrix strip being placed be-

tween the teeth, the cement is then crowded into the cavity from the side of the tooth into which the filling is to be inserted (Plate X, Figure Z) and, as soon as it is in place, the matrix strip is bent onto the cement from both sides, holding it in position until it is nearly hard. Remove the matrix strip and chisel off carefully the surplus cement. Draw a sandpaper strip through to be sure it is clear from the adjoining tooth; then remove the impression.

To get an impression of the occlusal surface, encircle the tooth in question with a piece of the matrix strip (a, Plate I), having it wide enough to extend above the end a trifle; hold the ends of the strip to-

gether and crowd the cement down on top of the tooth. When hard, remove the strip and take out the impression.

To take the impression for labial cavities extending under the gums, dust the cavity with soapstone. Prepare the cement as for other impressions, having first cut a strip of metal, similar in shape to a gum retractor; with this crowd the gum back and press the cement to place with the fingers, holding the cement and the retractor in position until it is hard.

Cement mixed to this consistency has a tendency to crowd out at the points of least resistance and would, unless the pressure were evenly dis-

tributed, give an incorrect impression of the cavity. The pressure of the matrix strip being equal, a perfect impression is obtainable, which is the foundation to build on and must be exact.

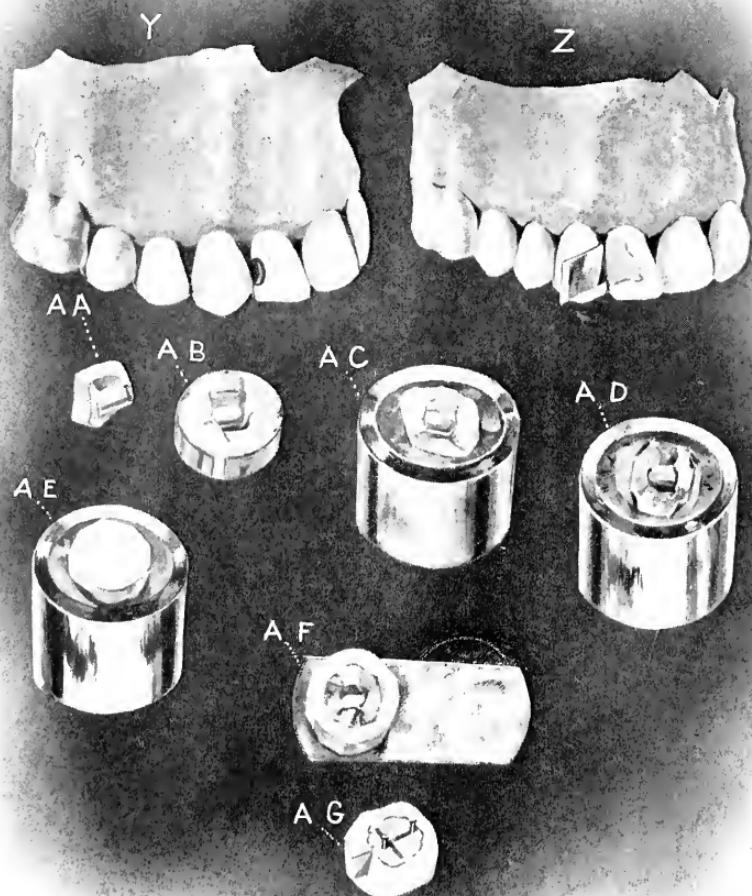


## MATRIX FORMATION

**M**ATRIX formation is the next step in the process of porcelain inlay. While it is of the highest importance, it is difficult to lay stress on any one point as being more essential than another. Each link in the chain of this work must be perfect, differing from other operations in the fact that a failure in any part of the operation is fatal.

It is impossible, in a majority of cavities prepared by this system, to obtain perfect adaptation to all parts of the cavity, except by swaging, it being essential that the whole surface be perfectly covered, as the





retention of the inlay depends on this feature.

By the system which this treatise exemplifies, contraction and expansion are perfectly controlled, thereby allowing an inlay to be made which exactly fits all parts of the cavity. To obtain this result, a correct impression of the cavity must be taken. The convex surface of the impression represents the exact inside of the cavity; the concave surface of the matrix swaged to fit this also represents the exact inside of the cavity. A filling baked to this concave surface after removing the matrix, must be a duplicate of the impression, and if contraction and expansion are controlled, must fit the cavity perfectly. 59

If the instructions in cavity preparations are followed closely one will have no undercuts; and with a good impression the making of a correct matrix is positive.

The impression (Plate X, Figure AA), taken by the process previously explained, is backed with cement in the re-enforcing ring (Plate X, Figure AB), as the strength of the impression unsupported would not be sufficient to withstand the strain to which it is necessary to subject it.

Use Britton's yellow for the impression, and the grey for the re-enforcing. The color will enable them to be distinguished and so pre-

vent the re-enforcement from encroaching upon the impression.

When hard, remove with a bur or chisel the portion of the impression and re-enforcement that would interfere with the swaging of a matrix or the drawing of a counter-die; *this latter feature is very important as a perfect matrix may be spread sufficiently to spoil it in the removal from the impression.*

Invest the re-enforced impression in the die-cup, using modeling compound for the investing material; trim off the surplus and take a piece of platinum 1-1000 inch in thickness, large enough to cover the impression, and form this to the impression, using Flaggs' instrument

No. 33, made by S. S. W. Fold the platinum on itself whenever it is necessary. The folding prevents tearing, and can be burnished out when it is worked down on the die. It is then annealed and returned to the die-ring. Place the die-cup (Plate X, Figure AC) in the die-cup receptacle (c, Plate I).

Now place a small ball of mouldine on the matrix and with the plunger, drive it home hard. Mouldine gives the best results, but other materials may be used, including rubber, soap, cement, etc. Remove the plunger, wipe off the mouldine, and with the small end, force the die-cup out of the receptacle, then burnish the margins of the inlay with a bur-

nisher No. 34, S. S. W. This will give a perfectly sharp margin. Now remove the matrix and make incisions about one-eighth of an inch apart extending around the border of the matrix; anneal and strike with the swage again. Now, with a chisel placed on the matrix just back of the margin, turn up the matrix in as many places as possible, using a sharp knife to place under the edges of the platinum in turning it back on to the chisel, producing the results as shown in Plate X, Figure AD. These edges and corners will engage the investment, which is poured on the matrix at this stage, having first oiled the parts surrounding the matrix to prevent the investment

sticking. This investment, incorporating the edges of the matrix, will prevent contraction and expansion, thus insuring a perfect fitting inlay, providing the previous instructions are closely followed. The matrix being re-enforced on the die with the investment material, precludes any possibility of changing its form while removing. Figure AE shows the invested matrix in the die-cup. Figure AF shows the invested matrix ready to receive the porcelain for baking.

Figure AG, Plate X, illustrates the invested matrix of the eighth class of cavities, showing the pins in position to be fused in the inlay. The perforation through the matrix

must not be made with a bur. An instrument a little larger than the pin should be sharpened to a three sided spear point and carefully worked through the matrix into the investment, and the pins inserted therein.

The investment material must be of such a nature that the extreme heat will not change its form; if it expands or contracts at all, it will draw the matrix with it. This investment becomes sufficiently hard to admit of perforation without danger of changing its form, allowing pins to be placed through the matrix into the investment which holds them in position while they are fused in the inlay.

## A METHOD FOR BUILDING ANTERIOR CONTOUR AND OCCLUSAL FILLINGS.



OR an explanation of this method, a cavity of the fourth class (Plate XI, Figure AH), advanced through the various stages to completion, will serve to illustrate the principles involved, which can also be applied to occlusal cavities.

After the cement impression has been taken, as previously described, crowd a piece of soft modeling compound into the cavity and, while in position, trim until it represents an inlay of the desired shape. Plate XI, Figure AI, shows the compound





inlay in position. Remove this inlay and place it on the invested matrix (Figure AJ), which represents the cavity from which it has been taken. If it fits the platinum matrix, you can feel sure of a perfect fitting inlay, as this step will prove the correctness of your work. Now fasten the modeling compound inlay to the matrix on the lingual side with wax. Dust the investment and compound inlay with soapstone and mix a sufficient quantity of cement according to the instructions previously given for taking an impression. Crowd this over the modeling compound inlay, but do not allow the cement to extend beyond the platinum as it will adhere

to the plaster and be apt to disturb the matrix when it is removed.

The cement counter-die is now removed and invested in the die-cup, and a platinum counter-matrix struck up. To do this without tearing the matrix, dust the cement counter-die with soapstone, then warm the end of a piece of modeling compound over a flame and after moistening fingers in water, draw it down to a point and press it in to the cement counter-die.

This modeling compound die will serve to form the platinum over, as it can be folded on itself so as to prevent tearing; and while the platinum is on the modeling compound die, force it into the cement counter-die. Now remove the modeling

compound, leaving the platinum matrix in the cement counter-die and place the die-cup in the die-cup receptacle and swage it to place, following instructions found in the chapter on matrix formation. The counter-matrix is then removed and invested in the investing material which can be held over the flame to hasten the setting. Both the platinum counter-die and matrix are covered with a thin layer of porcelain, the color desired for the surface of the finished inlay and baked to a bright glaze. The foundation colors are laid last, the reverse of the usual methods. The porcelain must not encroach on the margins as it would prevent the

approximation of the platinum counter-matrix with the matrix. The porcelain is then fused in the counter-matrix until it is nearly full; this usually requires two or three bakings. If you should get a surplus of porcelain in the counter-matrix, with a gem stone, grind out enough to allow the parts to go to place, then apply a quantity of moist porcelain powder on the approximating surfaces and gently crowd them together. If this is found to be difficult, moisten the powder freely and it will go to its proper position. The counter-matrix and matrix are now fused together.

When this is done, remove the platinum counter-matrix and with a

INSERT.

A METHOD FOR MAKING A MATRIX AND COUNTER MATRIX IN ONE PIECE FOR CAVITIES OF THE FOURTH AND SIXTH CLASSES.

**W**ITH a disk, shape the cement impression on the labial, approximal and incisal surface, in duplicate of the desired inlay, making them perfectly smooth. This contouring must be done before the removal of the impression from the tooth. If there is not enough cement to give perfect approximal contact, remove the impression and add to it the requisite

amount, trying it into the tooth, to prove this point; now reinforce and invest the impression. The concave surface of a matrix struck up on the impression of the cavity and extending over the surface of the cement which was contoured, will give, in one piece, a matrix for the cavity and a mold in which to bake, giving all the contour of the filling with the exception of the lingual surface which can be brought to its proper form with a brush.

brush, fill in any defects in the surface and fuse to a velvet gloss. This will produce an inlay slightly larger in all directions, but in the true alignment, it is finished according to instructions found on Contour, Margins and Insertion of the Inlay, the above method for building a contour filling should be used in cavities of the fourth, sixth, seventh and eighth classes.

## FUSING THE INLAY

**T**HE fusing temperature of the teeth manufactured by S. S. White & Co., Justi & Son, and the Consolidated Dental Manufacturing Co., is taken as a basis for the temperature in the following explanation.

The basis for the time for fusing is regulated by the melting of a pellet of gold in the furnace. On account of the divergent opinions of authorities, the degree of temperature for fusing the porcelain is not stated and, as experience has shown, the comparison with the melting of a pellet of gold is sufficiently accurate.

For the first baking, place a thin even layer of powder over the matrix, just enough to cover it, then with your brush, clean a strip about 1-32 of an inch in width around the part of the matrix representing the margin of the cavity and fuse to a bright glaze. This margin must be kept clean from porcelain for the first two bakings. The building of the inlay for the second baking depends upon the class of cavities involved. If it is for the first, second, third or fifth class, one can follow the lines of the matrix, building the inlay a little more than full. If it is for the fourth, sixth, seventh or eighth class the instructions on page 68, for building contour fillings should

be followed. The second baking should be from fifteen to twenty seconds less than the first, and the succeeding bakings fifteen seconds less than the second. This system aims not to disturb the first baking with the second, or the second with the third. The last coat should be brought to a satin gloss. It usually requires three bakings to complete the inlay. The time required to obtain the bright glaze of the first baking cannot be given, as it depends on the stability of the electric current, the button which the control lever rests on, the winding of the muffle, and the porcelain used. This may require some experimenting, but can soon be obtained by placing

a pellet of gold just inside the furnace door and taking your time from the melting of the gold until you get the bright glaze. Then follow the previous instructions for each succeeding baking. This rule also holds good with the gasoline furnace. Great care should be taken to prevent all drafts from striking the furnace while baking. After each baking, and while the furnace is at its maximum temperature, the inlay should be removed to the asbestos cooling disk, and covered immediately with the cooling cap (Plate I), which should be previously heated by setting on top of the furnace while baking. Allow it to remain over the inlay until it is at the temperature of the room be-

fore opening, as disastrous results will follow if this point is not observed.

It should be remembered that the margins of the inlay must be well covered at the last bake, as the writer is a firm believer in the ground margin instead of a fused one. My experience with the fusing of porcelain shows either a rounded margin, or a sharp, overhanging edge, either one being undesirable. The overhanging edge resting on the tooth beyond the margin of the filling, prevents the true adaptation of the inlay from being seen. This condition presents to the casual observer a pleasing appearance, but the careful operator ought not to be satisfied with a condition of this

kind. A gold filling that protruded beyond the tooth would not be tolerated, and we should not allow the same condition to exist with porcelain. This frail margin is sure to chip sooner or later, leaving an unsightly blemish.



## CONTOUR, MARGINS, AND INSERTION OF THE INLAY



**I**N this chapter we will consider three methods for obtaining contour and margins. The first two methods are applicable to cavities of the first, second, third and fifth classes.

With this method the inlay is taken, after it is baked and still in the investment, to the lathe and ground until the margins of the matrix, which represent the outline of the cavity, are visible; then the matrix is removed and the inlay cemented in the tooth. If it was not ground to a perfect contour of the tooth, it should be completed in the

mouth by the methods used for finishing a gold filling, using the Gem stones, Arkansas stones and fine sand paper and cuttle fish disks and strips. Then for the final polish use wooden points with polishing powder. The results of this method are entirely satisfactory providing the porcelain is not porous.

\* \* \*

The procedure for the second method is begun by obtaining a counter-die of cement; this must not be taken until the matrix is swaged. The die should then be dusted with soap stone and placed in the die-cup receptacle, with the counterdie-ring in position, having the thumb screw well to place. Then prepare a small mix of Britton's grey powder, the

same as for taking the impression, and drop it into the counterdie-ring. The plunger is placed in position and with a mallet tapped a few times. When the cement is hard, the die-cup and counterdie-ring are removed by means of an instrument forced through the hole in the bottom of the die-cup receptacle; now tap the plunger lightly until the die is disengaged. If care is taken this will give you a counterdie which is a duplicate of the cavity. After removing the matrix the inlay is stuck in the cement counterdie with wax, and ground to the desired contour on the lathe. A Hindostan stone is par excellence for this work, as it gives a beautiful margin

and leaves the filling, in a majority of cases, polished perfectly. But if you should desire to enamel the inlay, remove the wax with alcohol, replace it in the cement counterdie, or invest it in the investment material and, with a clean brush, cover the exposed portion of the inlay with a thin coat of glaze, place it in the furnace until the heat clears it up perfectly. This will sometimes give too high a polish; if so it can be reduced with a cuttle fish disk. The same precautions should be observed in removing it from the furnace as when baking.

Quite a different procedure is necessary to obtain the correct contour of cavities of the fourth, sixth, seventh and eighth classes, and for an

explanation of this method we will consider cavities of the fourth class, mesio-labial-lingual-incisal, taking the inlay, baked according to the instructions under the previous chapter, for contour operations, which gives us a filling slightly larger in all directions than it should be to harmonize with the contour of the tooth. We now remove the matrix and grind the approximal surface on the lathe, using a fine corborundum stone, until the filling will go to place. It is then retained in position by means of a wedge, and with modeling compound an impression is taken of the tooth containing the inlay, and the adjoining one. Before removing the im-

pression, take out the wedge; this will allow the inlay to come away with the modeling compound, fill this impression with a quick setting cement; the part of the cement coming in contact with the inlay should be very soft so as to obtain the required retention. After you have placed a little of this thin cement on the inlay, work a little more powder in the remaining cement and crowd it to place; when hard, remove the modeling compound and you have the inlay in a cement tooth, showing the proper alignment with the rest of the teeth. A sharp instrument placed between the cement tooth with the inlay, and the adjoining one will separate them. The inlay will

be attached sufficiently hard to allow the contour to be ground on the lathe. If the polish is sufficient after using the Hindostan stone, it can be removed from the investment and cemented to place. If further polish is desired, follow the previous instructions in this chapter.

When ready to set, roughen the cavity, and grind the inside of the inlay with a 3-16 inch fissure diamond disk, so as to engage the cement. The inlay should be kept wet while grinding to prevent darkening.

Harvard white cement should be used in setting all inlays. By mixing a nearly equal amount of water with the fluid, it will set perfectly in

ten minutes. Inlays for the fourth class are held in position while setting by inserting a wedge between the inlay and the adjoining tooth.

It is not necessary for cavities in the anterior teeth, to use the rubber dam. A piece of cottonoid placed under the lip, and another piece for the patient to bite on will give you all the time necessary for the cement to harden.



## FURNACES

**T**HE furnace to be used in Porcelain Inlay work is a matter of considerable importance, but a discussion of this subject cannot be made a portion of a treatise of this character. The author uses the Hammond Electric and the Turner Gasoline furnaces. There may be others equally serviceable.

The explanation under the heading of "Fusing" in the treatise is based upon experience with the electric furnace.

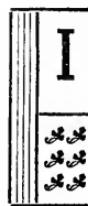
In using the gasoline furnace it is advisable to give it at least twenty minutes to heat up before starting to

fuse. Then the inlay is placed on the hearth until dry, and gradually moved into the back of the furnace. The fusing strip should be placed against the back of the furnace, and a small piece of fire clay placed against the front end of this strip.

The pellet of gold should be placed on the fire clay next to the fusing strip, and not more than one-fourth inch from the edge, and the mica door should be used instead of the fire clay plug to admit of vision.

Then follow the instructions on page 76.

## THE SHADOW PROBLEM



**I**N considering the shadow problem, three things well taken care of will eliminate most of the difficulties in that direction. If the cavity is so prepared that the walls are perpendicular to the surface of the tooth, it will give a body of porcelain whose shadow reflection will be the same at the margin as it is in the middle. This point cannot be emphasized too strongly.

Cavities on the labial surface near the incisal, present the greatest difficulties; the surface of the tooth being nearly flat, it allows the shadow

from the thin layer of cement to meet the eye at every angle.

Much better results are obtained with the gingival cavities, as the tooth at that point has sufficient curve to prevent the reflection of the cement meeting the eye.

Also, the thicker the inlay, the less is the shadow effect.

The next and the greatest thing which bears on this question is the cement. A transparent cement would overcome the shadow question, but one must get the best results possible with the cement now available.

An inlay that exactly fits the cavity, instead of being the thickness of the matrix smaller, gives the advan-

tage of having the least possible amount of cement between the inlay and the tooth, as the greater the amount of cement the heavier the shadow. Each point gained in this way brings this problem a little nearer solution.

The color of the cement is an important factor and must be considered; with an inlay the thickness of the matrix smaller than the cavity, the line of cement showing, compels the use of a cement that harmonizes with the color of the inlay. Each time the color of the cement is changed a different shadow effect must be overcome, and this frequently results in failure in what might otherwise have been success.

When the inlay exactly fits the cavity, it admits of so small an amount of cement that a certain color can be used for all inlays.

White is preferable as it gives the minimum shadow. This can be overcome by making the inlay about a shade lighter than the tooth, thus counteracting the shadow cast by the cement.



## A WORD IN CONCLUSION



brief summary of important points in the application of this system of porcelain inlay, is appended for ready reference. It will enable the beginner to feel more confident of his ground and, if faithfully adhered to, will avoid the danger of failure at the start, which is often charged to a new system, when it is more justly attributable to the newness of the practitioner.



Become thoroughly conversant with the theory and practice of this system before attempting to put it into operation.

Do not be afraid to cut away the tooth; it will be replaced with a similar substance.

Leave the walls of the cavity at all points perpendicular to the surface of the tooth.

Do not allow your cement impression to stay in the tooth until it is very hard; it will not be easy to remove.

In matching for color the inlay is more likely to be too dark than too light.

Be sure to grind out all of the color in the tooth not desired.

Do not place too much body in the matrix at the first baking: just a thin layer.

The foundation, or first baking, should be baked to a bright glaze.

To overcome the difficulty of handling small inlays while cementing them to place, fasten the end of a wooden tooth pick to the inlay with sticky wax. If

the cavity is nearly round, mark the gingival side of the tooth pick; this will be a sufficient guide to insure proper placing of the inlay.

Roughen the under surface of the inlay, and the inner surface of the cavity, so the cement will adhere.

In cementing the inlay to place, use nearly an equal amount of water with the liquid. It will hasten the setting.

Do not finish off the inlay before the cement is hard.

Do not use a coarse stone to grind the inlay.

Scrupulous and exact cleanliness must be observed with every step.

If this system is followed closely, it will eliminate much of the personal equation, and will enable the many to obtain perfectly satisfactory results with porcelain inlay.

It may be desirable to reduce a complicated cavity in some of the approximal, to a simple cavity of the second class, which can be done by restoring a portion of the cavity with gold, from beneath.

A pure mat platinum, similar to the mat gold, could be used advantageously to re-enforce and fill in a tear in the matrix, by swaging it to place with mouldine.

The necessary instruments for this system, are:

Chisels Nos. 75, 76, S. S. W.

Flaggs' Instrument No. 33, S. S. W.

Burnisher No. 34 small, S. S. W.

Gem Points Nos. 13, 14, S. S. W.

Gem Cavity No. 1, S. S. W.

Fissure Finishing Burs Nos. 57, 58.

Fissure Bur No. 57.

Pear Shaped Bur No. 1.

Britton Cement.

Arkansas Stone Point No. 5, S. S. W.

Hindoostan Lathe Stone,  $2\frac{1}{2}$  by 5-16 in.









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